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AUTHOR Denker, Elenor Rubin
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ABSTRACT

Seventeen Spanish-speaking children received mathematics instruction in either Spanish or English. Numeric concepts were chosen as the content area so that the results could be understood non-verbally at the outset, the teachers ranked the children's abilities in English and math, and no significant difference between groups was found. However, there was high correlation between achievement and mathematical ranks for the Spanish instructed (r=.74) and low correlation for the English instructed (r=.03). The correlation between achievement for the English instructed with English rankings was high (r=.88). It is concluded that children whose native language is not English perform in accordance with English competence when instructed in English; children who are instructed in their native language perform in accordance with ability in the subject area. (Author/CFM)

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Teaching Numeric Concepts to Spanish-speaking Second Graders: English or Spanish Instruction? *

Elenor Rubin Denker
The Graduate School and University Center
City University of New York

ABSTRACT: 17 Spanish-speaking children received Spanish or English instruction in a measuring task. Additionally, teacher rankings for English and math were obtained. No significant difference between groups was found. However, there was high correlation between achievement and mathematical ranks for the Spanish instructed (r=.74) and low correlation for the English instructed (r=.03); the correlation between achievement for the English instructed with English rankings was high (r=.88). It is concluded that children whose native language is not English perform in accordance with English competence when instructed in English; children who are instructed in their native language perform in accordance with ability in the subject area.

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One of the critical aspects that must be questioned in bilingual education is the academic consequence of the experience. The research findings to date are somewhat contradictory. In a recent evaluation of a bilingual program in California (Skoczylas, 1975), it was found that language development was similar for bilingually instructed and monolingually instructed students; however, the monolingually instructed scored higher on a math test administered in English. On the other hand, in a 1973 evaluation of a French-English program in Louisianna, Gardiner found that the bilingually instructed performed better in French, English and math.

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Older studies were equally contradictory. MacNamara (1967) found that Irish bilinguals were poorer than monolinguals in problem arithmetic. Treviño (1965), on the other hand, found that bilingually instructed first graders did significantly better than monolingually instructed on a test of arithmetic fundamentals.

With these results as background, I developed a design to examine the effects of native-language instruction versus second language instruction. I chose numeric concepts as the content area primarily so that the assessment procedure could be understood non-verbally. In addition, I felt that the math abilities would be unrelated to language ability and a source of contamination could be eliminated in this way.

I chose a non-English speaking second grade class. In New York City, at the time I did this study, the procedure was to form one class on each grade level of students who hadn't learned English yet. These classes often had Greek speaking children, a Russian or two, perhaps one Chinese child, and mostly Spanish-speaking children from Cuba, Puerto Rico and the Dominican Republic. (Often in the beginning of the year, the teacher and the few non-Spanish speaking students were the only ones who didn't understand what was going on.) The other students quickly learned Spanish. The children, of course, learned English at various speeds. By the Spring, when this study was conducted, some spoke a fair amount of English, and some, the newest arrivals for example, understood almost no English. In the class I chose, there were twenty Spanish-speaking

children at various levels of English ability. They were assigned randomly to the English-instructed group, or the Spanish-instructed group for the purposes of this study. I taught each group the same four lessons. The content of the lessons was identical in both groups. In these 15 minute lessons the children were taught how to use a ruler, what inches and feet are, when a tapemeasure or yardstick are appropriate. The children were then evaluated individually. First seven objects were presented for the children to identify in English: foot, inch,square, rectangle, ruler, yardstick, tapemeasure. They were then given a ruler and asked to measure two lines of eight inches and three inches, to draw a four inch line and a six inch line, and to draw a square, five inches by five inches.

There were four hypotheses I wanted to investigate. The first was that the overall achievement level of the Spanish-instructed group, as measured by the specially designed test, would be higher than for the English-instructed group. I based this hypothesis on the fact that all the children included in the analysis spoke Spanish, and some did not speak much English. Secondly, I predicted that the children with greater math ability would do better on the test. To assess math ability, I asked the teacher to rank the students on this variable. The third hypothesis was that for those instructed in English, their English ability would strongly correlate with their performance on the math test. Here again, I assessed English ability by having the teacher rank the

students in the class. And last, I predicted that both groups would learn the vocabulary words, in English, equally well.

The results. There was a maximum score of twenty on the math test. The English-instructed group had a mean score of 14.1, and the Spanish instructed group a mean of 14.0. So, both groups, it seems, learned the same amount of math. The Spanish-instructed group also scored higher on the English vocabulary section of the test than did the English-instructed group.

How did the ranks relate to the math test scores. The results were very interesting, and the correlations much higher than I expected, considering the generally poor reliability of teacher ranks, and the small size of the sample. The overall correlation between math ability ranks and math test was only .39. However, for the Spanish-instructed group there was a .74 correlation between math ability ranks and test score. For the English-instructed group the corresponding correlation, between math ability ranks and test score was only .05. However, for this group, the English-instructed, the correlation between English fluency ranks and math test was .85.

What generalizations can be drawn from this small study? At first view it would seem that language of instruction didn't affect academic achievement - both groups did equally

well. However, when these results are examined more closely, it turns out that something very different was happening in these two groups. The children receiving instruction in Spanish were learning in accordance with their math ability. While, for those in the English group, their math ability was an extraneous factor. Another conclusion from the data is that measuring, which is within the arithmetic curriculum, essentially requires a combination of verbal and quantitative skills. For this reason there was a very high correlation between English fluency and test score in the English-instructed group, and yet both groups overall had equivalent results.

If these results can occur for a topic such as measuring, where verbalization is minimal, the consequences for social studies, and science must be even more pronounced. I want to close with the thought that the academic consequences of bilingual instruction are only one area of importance; the student's emotional reaction is also of vital concern. How frustating it must be to the bright math pupil to misunderstand math concepts due to language limitations.

In this study, both groups received monolingual instruction. The data, however, supports the use of bilingual methods. If the measuring concepts had been presented in both English and Spanish to all the children, they would have been able to use their individual abilities, either linguistic or mathematical, which would have resulted in more successful performances.

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